



# GDOT Publications

## Policies & Procedures

**Policy:** 8085-1- Geospatial Data Policy and Standards

**Section:** Geospatial Standards

**Office/Department:** Office of IT Application Support & Development

**Reports To:** Division of Information Technology

**Contact:** 404-631-1000

### PURPOSE

This document sets the IT policy and subsequent standards for the format of geospatial data that is acceptable for incorporation into the IT systems of the Department. The purpose of this document is to provide a consistent set of specifications for the delivery of digital geospatial products for integration with the Enterprise Geographic Information System (EGIS). The objective of this document is to reduce integration conflicts and facilitate access to geospatial data in Information Technology (IT) systems. This document also establishes the requirement of collecting and managing geospatial metadata describing the agency's geospatial assets to facilitate GDOT's commitment to data sharing, integration, compatibility among users of the agency GIS system and promoting secondary data use.

### SCOPE

- A. This policy addresses geospatial data standards and its operations in the context of data life cycle phases, consisting of (A) planning, (B) collection and acquisition, (C) processing and documentation, (D) storage and access, and (E) maintenance and retirement.
- B. This policy applies to:
  - 1. All GDOT Offices and Districts.
  - 2. Geospatial products gathered from third party source (local government, federal agency, or private vendor) by a party contracting with GDOT.
  - 3. Geospatial products from third party source and modified by a party contracting with GDOT.
  - 4. New geospatial products or datasets collected or created to meet GDOT project requirements.
  - 5. Existing IT databases or files that store geographic coordinates.

### RESPONSIBILITY

- 1. The IT Director/CIO retains authority for enforcement and monitoring of this policy.
- 2. The Administrator of the IT Office of Applications Support & Development is responsible for compliance with the policy, updates to the policy, monitoring, and enforcing the policy.
- 3. In the absence of the IT Office of Applications Support & Development Administrator, the Assistant Administrator(s) of the IT Office of Applications Support & Development is/are responsible for compliance with the policy and for reporting concerns to the IT Director/Chief Information Officer.

### SUPPORTING DOCUMENTS

**Policy:** 8085-1 - Geospatial Data Policy and Standards

**Date Last Reviewed:** [Date Last Reviewed]



DOC ID	Title	Description	Reference No.
	USGS National Standard for Spatial Data Accuracy	<a href="http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy">http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy</a>	
	United States National Map Accuracy Standard	<a href="http://nationalmap.gov/standards/nmas647.html">http://nationalmap.gov/standards/nmas647.html</a>	
	Content Standard for Digital Geospatial Metadata	<a href="http://www.fgdc.gov/metadata/csdlgm/">http://www.fgdc.gov/metadata/csdlgm/</a>	
	USGS "mp" Compiler for Formal Metadata	<a href="http://geology.usgs.gov/tools/metadata/tools/doc/mp.html">http://geology.usgs.gov/tools/metadata/tools/doc/mp.html</a>	
	O.C.G.A. 32-4-2 (a)1, (a)2)(A),(b), (e), (f): O.C.G.A. 32-4-21: O.C.G.A. 32-4-41 (4): O.C.G.A. 32-4-91 (b):GDOT's statutory purpose	<a href="http://www.lexis-nexis.com/hottopics/gacode/default.asp">http://www.lexis-nexis.com/hottopics/gacode/default.asp</a>	

## DEFINITIONS

Term	Definition
Accuracy	The degree to which a measured value conforms to true or accepted values. Accuracy is a measure of correctness. It is distinguished from precision, which measures exactness.
Contractor / Consultant	Party responsible for the delivery of the product
ESRI	Environmental Systems Research Institute
FGDC	Federal Geographic Data Committee
GDOT	Georgia Department of Transportation
Geospatial	A set of technological approaches, such as GIS, CAD, GPS, surveying, photogrammetric, remote sensing, used for acquiring and managing geographic data.
Geospatial Application	Scripts, software, or source code used to manipulate geographic data.
Geographic Data	An electronic format of data containing both geometry (pixels/rasters and vectors) and the means to relate that geometry to a prescribed coordinate system. Often the data is referred to as geospatial or GIS data.
Geospatial Desktop Toolset	Macros or a group of geoprocessing tools to automate similar tasks.
GIS	Geographic Information System(s)
GPS	Global Positioning System(s)
IT	Information Technology
Metadata	Information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information. Metadata for spatial data may describe and document its subject matter; how, when, where, and by whom the data was collected; availability and distribution information; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard. Metadata consists of properties and documentation. Properties are derived from the data source (for example, the coordinate system and projection of the data), while documentation is entered by a person (for example, keywords used to describe the data).
NSSDA	National Standard for Spatial Data Accuracy
Precision	The number of significant digits used to store numbers, particularly coordinate values. A statistical measure of repeatability, usually expressed as the variance of repeated measures about the mean.
Raster	A spatial data model that defines space as an array of equally sized cells arranged in rows and columns, and composed of single or multiple bands. Each cell contains an attribute value and location coordinates. This includes geo-



	referenced aerial photography, satellite imagery, or other picture format. Raster may be in single or multiple bands. Raster data may be compressed or uncompressed.
Resolution	The smallest spacing between two display elements or coordinate values.
USNMA	United States National Map Accuracy Standard
Vector	A coordinate-based data model that represents geographic features as points, lines, and polygons. Each point feature is represented as a single coordinate pair, while line and polygon features are represented as ordered lists of vertices. Attributes are associated with each vector feature, as opposed to a raster data model, which associates attributes with grid cells.

## POLICY STATEMENTS

### A. Data Planning Phase

Geospatial data that is collected, acquired, or managed in conjunction with a project must post the metadata for their geospatial data on the GDOT's Enterprise Geospatial Metadata Catalogue, and must comply with the following requirements:

- I. Assure that geospatial information operations comply with all standards to meet GDOT's design objectives, and produce documented results. All data is expected to meet both data referential integrity and geometry topology. These design features are justified based on its function and fit within the existing GDOT data schema. The Office of IT Applications Support & Development must plan data architecture that supports its operation.
- II. Project requirements shall determine the sensitivity of geospatial data in accordance with GDOT's Data and Asset Categorization policy (POL-IT-025), which is based on FIPS 199. Data products paid for by GDOT will become property of the agency. Copies of data will be made available to interested parties in accordance with all public freedom of information acts (FOIA), unless the data is delivered with license restrictions or license agreements. However, the agency will be the holder of the data of record. Any copies of the data released by the agency will contain a liability disclaimer. The reselling of GDOT geospatial data is prohibited. The distribution of GDOT geospatial data is prohibited without the expressed written permission of the agency.
- III. Geospatial data planning shall adhere to standards in designing data collections that will enable data sharing and promote secondary data use and quality information. Geospatial Data Specifications:
  - i. Entity Naming
    1. File and Layer Naming
      - a. File names will contain only alphanumeric characters (i.e. letters, numbers);
      - b. File names will start with a letter;
      - c. File names will be entirely in lowercase;
      - d. No spaces, dashes, or special characters will be used;
      - e. Common GDOT abbreviations should be used where applicable.
    2. Attribute Item and Field Naming:
      - a. Item names will contain only alphanumeric characters (letters and numbers) and underscores;
      - b. Item names must start with a letter;
      - c. No spaces, dashes or special characters will be used;
      - d. Common GDOT abbreviations should be used where applicable; To insure successful SDE data loading, item and attribute names must not contain Oracle Reserved Words;



- e. Addresses will not be duplicated (i.e. two or more point, arc, or polygon features must not have the same street name, street number, and unit number or the same street name and address range.
- ii. Data Format
  - 1. Vector Data - Consistency must exist in the development of point, multi-point, line, multi-line, measured shapes, simple polygons and complex polygons that are received by GDOT.
  - 2. GDOT supports ESRI geodatabase, shapefile, and coverage file formats.
  - 3. Topology file format:
    - a. In geodatabase topology,
      - i. the user is responsible for maintaining topologically correct features;
      - ii. if topology has been assigned to a geodatabase submitted to GDOT's Office of IT Applications Support & Development, detailed definitions of the assigned topology rules must be submitted as well.
    - b. Shapefiles: No formal topology exists within shapefiles. (GDOT Office of IT Applications Support & Development will define needed requirement for this.)
    - c. Coverage file: Nodes or polygons must be present in an ArcInfo coverage in order to create topology. To create and maintain coverage topology, the following must be met:
      - i. Correct arc directionality must be maintained on streets, facility data, and any dataset with flow;
      - ii. Polygons must close without overshoots or undershoots;
      - iii. Pseudo nodes must only exist where
        - 1. a line closes on itself
        - 2. only two lines intersect
        - 3. there is a change in attribution along a line
        - 4. to maintain the shape and measurements of an arc;
      - iv. Lines, polygons, points and annotation must not be duplicated;
      - v. Streets and facility data do not break at overpasses and underpasses;
      - vi. There is a maximum of 500 vertices per arc limit with ArcInfo software;
      - vii. Polygons must have only one label per feature; Polygons must edge match without slivers;
      - viii. Polygons must not overlap.
  - 4. Coverage's shall be transmitted in ARC/INFO interchange (\*.e00) file format.
  - 5. Any data format conversions between the development platform and the deliverables shall not induce any degradation of the final product.
  - 6. Raster Data - All raster data will be delivered in TIF or GeoTIFF format with lossless compression. GDOT will accept MrSID and ECW compressed formats only if accompanied with raw formats. World File or proper header is to be included with coordinate precision of 2 significant figures originating in the upper left-hand corner pixel.
  - 7. Shape and granularity - The shape of polygons and line will as true to the form as scale and the input data source permit.
  - 8. Length and Area Measures - Length and area measures are accurate to within scale and the input data source parameters. Length and area are to be reported in GDOT project measurement



requirements.

iii. Completeness of Feature:

1. Number of Features - All reasonable attempts shall be made to insure all real world features are captured and that no double counting is recorded.
2. Temporal Nature - The temporal nature of the feature will be recorded, or taken into account as appropriate. Features to be captured in the course of the data development might either cease to exist, or change in the course of development. Time stamping of either the dataset publication or the record of the feature will discern these phenomena and be recorded in the metadata or attribute table.

iv. Attribute Completeness and Accuracy: Proper annotation labeling and the complete and accurate entries of the features captured are expected. This accuracy in recording includes using the proper data value typing for the recording of attributes.

v. Projection, Datum, and Spheroid: Metadata will specify a defined projection, datum, unit of measure, and coordinate system. Generally geospatial data will be projected to GDOT defined projection parameters. If data are to be shifted between datum's then the data will be "un-projected" back to Geographic WGS 84 coordinates, shifted between datum and re-projected to the new projection.

vi. Supported Data Projections: GDOT will accept un-projected data registered to the Geographic WGS 84 coordinate system. GDOT will also accept data in UTM or State Plane projections. GDOT prefers delivery of data for incorporation into the enterprise GIS as Lambert Conformal Conic for the State of Georgia using the North American Datum of 1983.

Horizontal coordinate system definition:

Coordinate system name:

\*Projected coordinate system name:

NAD\_1983\_Georgia\_Statewide\_Lambert

\*Geographic coordinate system name:

GCS\_North\_American\_1983

Planar:

Map projection:

\*Map projection name: Lambert Conformal Conic

Lambert conformal conic:

\*Standard parallel: 31.416667

\*Standard parallel: 34.283333

\*Longitude of central meridian: -83.500000

\*Latitude of projection origin: 0.000000

\*False easting: 0.000000

\*False northing: 0.000000

Planar coordinate information:

\*Planar coordinate encoding method: coordinate pair Coordinate representation:



\*Abscissa resolution: 0.004167 \*

Ordinate resolution: 0.004167

\*Planar distance units: survey feet

Geodetic model:

\*Horizontal datum name: North American Datum of 1983

\*Ellipsoid name: Geodetic Reference System 80

\*Semi-major axis: 6378137.000000

\*Denominator of flattening ratio: 298.257222

Vertical coordinate system definition:

Altitude system definition:

\*Altitude resolution: 1.000000

\*Altitude encoding method: Explicit elevation coordinate included with horizontal coordinates

## B. Data Collection and Acquisition Phrase

I. Collection. Data stewards shall collect the following information at the initial period of data collection, creation, acquisition or subsequent post-processing:

1. Latitude and Longitude or Global Positioning System (GPS) Coordinates: As mentioned above the agency's coordinate format is Geographic Decimal Degrees in World Geodetic System 1984 (WGS84) for North America.

- a. All coordinates for features within the State of Georgia shall be within the maximum and minimum latitude and longitude coordinate extents of the boundaries of the State of Georgia.
- b. All longitudinal coordinates within the State of Georgia will be stored as a negative number.
- c. All latitude and longitude coordinates will be stored at minimum a double precision of 5 decimal places. Coordinates with less than 5 decimal places results in data at a precision that is incompatible with the precision of GDOT GIS data. The maximum precision stored shall be the maximum precision of the device or method used to capture the coordinates.
- d. Coordinates are to be expressed in decimal degrees within a single column or field and not to be split into separate columns for degrees, minutes, seconds or their variants with Northings and Westings.
- e. In all cases the coordinate system, datum, units of measure, and projection (if appropriate) are to be identified within metadata.

**Note:** Latitude and Longitude coordinates should not be expressed in geographic projection such as State Plane or Universal Transverse Mercator (UTM) or any other projection.

- f. Area Boundaries: Geographic area boundaries shall be collected and appropriately documented in accordance with FGDC data standards. Accuracy & Resolution: Positional Accuracy - National Standard for Spatial Data Accuracy's Horizontal Accuracy and United States National Map Accuracy Standard's protocols are to be followed for all data generation. USNMA's Vertical accuracy will be invoked where appropriate. Cadastral quality data will be meet NSPS Model Standards for Property Surveys. RMS error calculations will need to be performed for interim reporting. Relative positional accuracy at the 95 percent confidence level will be required for all



vector and image data. Minimum mapping units will be furnished to the agency. Positional accuracy is required within the metadata document.

- g. Orientation - Unless otherwise specified, the directional North will coincide with 'up' as referenced by the geospatial boundary for the dataset.
2. Geospatial Metadata - All delivered data shall have FGDC compliant metadata following the Content Standard for Digital Geospatial Metadata. Metadata will parse using the USGS "mp" compiler for formal metadata without error.

. Identification

Required Subsection	Description	Category
Citation	Publication Information: Date, Time, Title, etc.	Data Sets
Description	Data abstract, purpose statement. The description includes data definitions, capture conditions and representation rules. The abstract will includes appropriate uses of the data.	Specifications
Time Period of Content	Describes the range of time during which the data were captured	Data Sets
Status	Progress ("Complete", "In-progress", "Planned"), and maintenance and update frequency	Data Sets
Spatial Domain	The geographic area domain of the data set (longitude, latitude)	Data Sets
Keywords	Words or phrases summarizing an aspect of the data set	Specifications
Access Constraints	Restrictions and legal prerequisites for accessing the data set	Data Sets
Use Constraints	Restrictions and legal prerequisites for using the data set after access is granted	Data Sets
Data Set Credit	Recognition of those who contributed to the data set	Data Sets

a. Data Quality

Required Subsections	Description	Category
Attribute Accuracy	An assessment of the accuracy of the identification of entities and assignment of attribute values in the data set. This will confirm the use of data definitions in the specifications, along with identification of any non-conforming data and the reasons for their inclusion.	Data Sets
Logical Consistency Report	An explanation of the fidelity of relationships in the data set and tests used. These relationships will be defined as part of the data definitions, and conformity demonstrated by reports of tests run on the data by the producer. Those tests can be repeated by the receiving party for confirmation.	Relationship definitions: Specifications Test reports: Data Sets
Completeness	Information about omissions, selection criteria, generalization, definitions used, and other rules used to derive the data set. Definitions of completeness will be part of the specifications, and conformity demonstrated by reports of tests run on the data by the producer. Those tests can be repeated by the receiving party for confirmation.	Complete definitions: Specifications Test reports: Data Sets
Positional Accuracy	An assessment of the accuracy of the positions of spatial objects. Definitions of positional accuracy will be part of	Accuracy definitions:



	the specifications, and conformity demonstrated by reports of tests run on the data by the producer. Those tests can be repeated by the receiving party for confirmation.	Specifications  Test reports: Data Sets
Lineage	Information about the events, parameters, and source data which constructed the data set, and information about the responsible parties. Definitions of acceptable data lineage will be part of the specifications, and conformity demonstrated by source materials submitted by the producer. Those sources can be examined by the receiving party for confirmation. Note that lineage includes the Process Step and Process Description elements. Process Step and Process Description provide a means to track processing down to the feature level of data production and maintenance.	Lineage definitions: Specifications  Test reports: Data Sets

b. Spatial Data Organization Information

Required Subsections	Description	Category
Indirect Spatial Reference	Name of types of geographic features, addressing schemes, or other means through which locations are referenced in the data set. Examples: coverage names, shapefile names, SDE layer names, etc.	Specifications
Direct Spatial Reference	The system of objects used to represent space in the data set: "Vector" or "Raster"	Specifications

c. Spatial Reference Information

Required Subsections	Description	Category
Horizontal Coordinate System Definition	Projection, grid system, etc.	Specifications
Vertical Coordinate System Definition	Datum, etc.	Specifications

d. Entity and Attribute Information (Detailed Description)

Required Subsections	Description	Category
Entity Type	Name, definition and source for the entity	Specifications
Attribute	Attribute name, description, source, domain of values, etc.	Specifications

e. Distribution Information

Required Subsections	Description	Category
Distributor	Contact information for the distributing organization	Data Sets

f. Metadata Reference Information

Required Subsections	Description	Category
Metadata Date	the date that the metadata were created of last updated	Data Sets
Metadata Contact	Contact information	Data Sets



Metadata Standard Name	Content Standard for Digital Geospatial Metadata (CSDGM)	Data Sets
Metadata Standard Version	CSDGM Version	Data Sets

- g. Metadata Completeness - Logical processing steps and data dictionary for attribute codes are of critical importance for due diligence in agency operations and will be required for all data. All data layers must have metadata that conforms to FGDC standards

- II. Acquisition: Geospatial data that is acquired by GDOT (including contractors, grantees and vendors), must comply with all standards applicable to those data as if they were collected by GDOT.
- III. Initial Data Documentation: Initial documentation of geospatial metadata shall be accomplished during the collection and acquisition phase to provide information on the steps and methods followed in acquiring the spatial information. This information must be posted on the above mentioned GDOT's Enterprise Geospatial Metadata Catalogue.
- IV. Coordination: The GIS team lead shall periodically publish information on geospatial data collection activities across the GDOT for the purpose of enhancing coordination, reducing duplication, and increasing the opportunity for secondary data uses.

#### C. Data Processing and Final Documentation

The data processing phase, including methods used during the phase, must be adequately documented per applicable FGDC content standards

- I. Data Processing: Geospatial data managed within GDOT must conform to data exchange protocols, and applicable data standards as defined and maintained by GDOT's Office of IT Applications Support & Development.
- II. Spatial Data Documentation: Documentation of geospatial metadata shall be prepared for all spatial data elements entered into GDOT's databases by offices and/or agents of GDOT that originate or modify spatial data, in accordance with the provisions of FGDC-STD-001-1998, Content Standard for Digital Geospatial Metadata.

#### D. Data Storage and Access Phase

- I. Spatial Data Storage. Spatial data that accompanies regular programmatic reporting will typically be reviewed by GDOT's data validation methods prior to data storage. The Office of IT Applications Support & Development GIS technical staff will determine methods to validate the source and integrity of the data sets received from reporting entities and direct the data to initial processing for final storage locations. The Office of IT Applications Support & Development technical staff for GDOT's primary data collections shall insure the following:
  - Screening and Correction. GDOT shall screen information from all sources for compliance with this Policy and standards. If the data is submitted under an agreement and is found to be noncompliant, it shall be returned to the originator for correction. If no agreement is in place, then it may be returned to the originator for voluntary correction or it may be used in uncorrected form at project discretion, but annotated as necessary to document areas of noncompliance.
- II. Data Access Phase. GDOT shall follow all statutory and regulatory requirements, where they exist, in providing access to all GDOT spatial data resources. Where they do not exist, the GDOT Office of IT Applications Support & Development will provide access based on the data sensitivity analysis and FOIA (freedom of information act). In all other cases, GDOT will make all reasonable efforts to provide access to spatial data in accordance with GDOT policies in affect at that time.



- III. Delivery Media - All files shall be delivered within a compressed ("zipped") file. Files less than 5 MB in size may be delivered via email. All files greater than 5 MB in size shall be placed on a contractor's ftp site for download and provided in CD-ROM or DVD-ROM format. Files greater than 1GB may be delivered to GDOT on flash media or USB 2.0 hard drives to meet delivery dates. However, copies on CD-ROM or DVD-ROM must be provided to complete delivery. All media must include text documentation describing the content of each file contained on the disc.

E. Data Maintenance and Retirement Phase

- I. General Responsibility: The business unit or project sponsoring the original collection effort is responsible for decisions regarding ultimate retention and disposal of spatial data. The GDOT Office of IT Applications Support & Development GIS Team is responsible for spatial data maintenance.
- II. Data Maintenance Protocols: If the nature of the spatial data is to be updated or appended at some interval then a schedule will be identified and documented within metadata. Data ownership, maintenance responsibility, access permissions, distribution policy, and retention schedule must be provided within the metadata in order for geospatial data to be incorporated into GDOT IT systems. Furthermore, they must follow all applicable GDOT IT data governance policies in affect at that time.
- III. Change Control: During the course of the contract some technical elements may change. While the nature of the change should not affect the general scope of the data development, it may invoke cost saving measures that new technologies make available or economies of scale that were missed in the original specifications. Change control elements will be communicated for approval by GDOT Office of IT Applications Support & Development.
- IV. Geospatial Data Retirement: Geospatial data records in the form of coverages, tables, files, working or draft files, in both hard copy and electronic format, are to be treated as official GDOT documents for the purpose of records management. Data disposition for archiving shall comply with the business unit's records retention requirements of the program under which the data was collected.

## References:

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## History:

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